Types of Reactions

1) Butan-1-ol can be oxidised to form a carboxylic acid.
(i) Write the name or formula of a suitable reagent that could be used to carry out the reaction. Include any specific conditions.

(ii) Describe the colour change that would be observed.

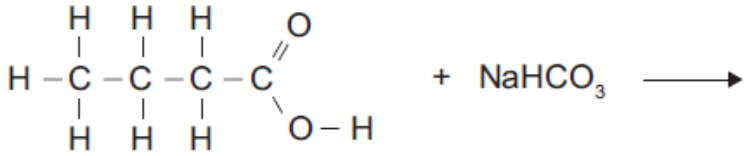
(iii) One of the other alcohol isomers of $C_4H_{10}O$ can also be oxidised to form a carboxylic acid. Identify this isomer by name or structural formula: Explain your choice of isomer.

2) When butanoic acid reacts with sodium hydrogen carbonate, NaHCO3, fizzing can be seen during the reaction.

(i) What type of reaction is occurring?

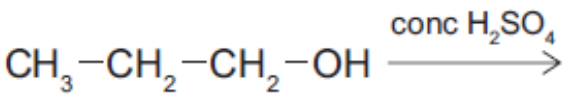
(ii) Explain why fizzing is observed during the reaction.

(iii) Complete the equation below to show the structural formula of the organic product formed.



3) Chloroethane, CH_3CH_2Cl, reacts with aqueous KOH, alcoholic KOH, and with NH_3. Compare and contrast the reactions of chloroethane with the three reagents. In your answer you should include:
• the type of reaction occurring and the reason why it is classified as that type
• the type of functional group formed
• equations showing structural formulae for reactions occurring.

4) For each of the following reactions:
• Write the structural formula of the organic product formed.
• State the type of reaction occurring. Choose from the word list: elimination or addition or oxidation or substitution or hydrolysis or halogenation or acid-base



5) For each of the THREE following reactions:

• Write the name or structural formula of the reactant used.
• State the type of reaction occurring. Choose from acid-base or addition or elimination or hydrolysis or substitution

i) $CH_3-CH=CH_2$ (propene) $\xrightarrow{\textbf{Reactant A}}$ $CH_3-CH(OH)-CH_3$ (propan-2-ol)

ii) $CH_3-CH(OH)-CH_3$ (propan-2-ol) $\xrightarrow{\textbf{Reactant B}}$ $CH_3-CH=CH_2$ (propene)

iii) $CH_3-CH_2-CH_3$ (propane) $\xrightarrow{\textbf{Reactant C}}$ $CH_3-CH_2-CH_2Br$ (1-bromopropane)

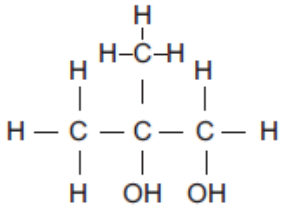
6) Hydrocarbons can undergo addition and substitution reactions.
Compare and contrast addition and substitution reactions. Use the reactions of ethane, $CH_3–CH_3$, and ethene, $CH_2=CH_2$, with chlorine as your examples in your answer.

Your answer must also include:
• a description of each type of reaction
• conditions for addition and substitution reactions
• equations showing the structural formulae of the organic reactant(s) and product(s).

7) Give the **structural formula** of the organic product formed when:
(i) Ethanol, C_2H_5OH, reacts with acidified potassium dichromate solution.

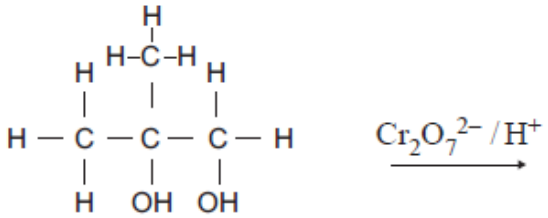
(ii) Ethanoic acid, CH_3COOH, reacts with sodium carbonate solution.

(iii) One of the isomers of C_4H_8 can be oxidised with potassium permanganate, $KMnO_4$, to form 2-methyl propan-1,2-diol. Complete the following equation to show the **structural formula** of the isomer of C_4H_8

$\xrightarrow{KMnO_4}$ 

2-methyl propan-1,2-diol

(iv) 2-methyl propan-1,2-diol can be further oxidised with acidified potassium dichromate, $Cr_2O_7^{2-}$ / H^+, to form a compound with molecular formula $C_4H_8O_3$. The compound $C_4H_8O_3$ reacts with sodium carbonate solution to form bubbles of carbon dioxide gas.
Draw the **structural formula** of the compound $C_4H_8O_3$ below.



2-methyl propan-1,2-diol